Society Proceedings

NEW YORK NEUROLOGICAL SOCIETY

October 6, 1908

The President, Dr. B. Sachs, in the Chair

THE SEAT OF CONSCIOUSNESS

By Frederick Peterson, M.D.

Consciousness, the speaker said, was a word in everybody's mouth. We used it glibly, as if we knew all about it. Psychologists, metaphysicians, physiologists and physicians had all written a great deal concerning it, but if they had said anything of any great significance, it had eluded his observation. The most tangible thing that he had been able to grasp in reading their works was that consciousness was a stream, a flow, a flight, a current, a thread, an "orderly succession of changes." He took it for granted that whatever consciousness might be, it had a seat. It was assumed that if the body be removed portion by portion, first the legs and the arms, and then the trunk as far as the base of the skull, that consciousness, if the circulation and oxygenation be kept up, still persisted in the head, and that its seat was in the brain. Such an experiment, in effect, had often been performed for us in broken necks and other spinal cord lesions. Those who had dared to surmise further had intimated that consciousness was diffused throughout the brain, or even that it was an attribute of the cortex of the brain alone.

With this preliminary statement, Dr. Petersen said, he would take a plunge at once into a subject that he knew as little about as anyone, not so much with the hope of establishing any new fact as for the purpose of provoking a discussion that might lead to some light in so much obscurity. In his opinion, the seat of that power which produced the manifestations of consciousness was in the basal ganglia (probably the corpora striata), and that consciousness was a peculiar summation of energy at that point, capable of being directed like the rays of a searchlight into this or that portion of the brain.

In pointing out the lines of reasoning which had led him to this conclusion, the speaker first referred to the daily physiological variation of consciousness in the condition of sleep, which was certainly a reduction in consciousness from the highest summation of energies to some lower level. Sleeping and waking were to be observed in a vast group of animals that had little or no cerebral development. Furthermore, the phenomena of sleep were observed in newly born human infants, despite the fact that the cerebrum was quite empty of experiences and anatomically still much undeveloped as to its connections with the rest of the brain. They were also observed in children born without a cerebrum, and even in dogs deprived of their hemispheres. In innumerable cases of extensive loss of cerebral substance, of a hemisphere, as in infantile cerebral palsies, a frontal lobe in the crow-bar case, etc., consciousness itself seemed unimpaired throughout life. These observations seemed to show that consciousness, at least as regarded its variations in the condition of sleep, did not reside in the cerebrum.

Another argument of a similar bearing was the fact that every individual with a brain stored full of all the experiences of a lifetime was only actually awake at any one time around some particular small group of functions or ideas that occupied consciousness at the moment.

Passing now to another series of pathological conditions, the one disorder which had led him to think much of this subject was epilepsy, in which disease loss of consciousness was the most extraordinary and often the only symptom. He alluded chiefly to such remarkable conditions as the tic de salaam and other forms of petit mal, in which the patient dropped suddenly to the floor with loss of consciousness, and quite as suddenly rose again in full possession of his faculties. The loss of consciousness was complete and often lasted but a fraction of a second. How could we account for such a phenomenon? If consciousness were a diffused attribute of the whole brain, what spasm of blood vessels or other physical process familiar to us could act and be readjusted with such speed?

The question now arose, what portion of the brain was so constructed as to be, apparently, in intimate connection with every other? The corpora striata. There was no part of the brain that we knew so little of. As Edinger said, here we had "a mighty portion of the brain that must be of enormous significance; otherwise it would not be always present, from the fish up to the man."

Mr. Henry Rutgers Marshall said that a few years ago it would have been a matter of surprise to find such a subject presented for discussion before a body of neurologists, as it would have been considered to belong more particularly to the field of psychology. The speaker thought the thesis presented by Dr. Peterson open to discussion, in that it attempted to describe consciousness in terms of energy. We had become more or less accustomed to similar descriptions since the appearance of Ostwald's work, in which he had attempted to define consciousness in terms of energy, but since the publication of that work, psychologists and philosophers had been endeavoring to bring meaning into his statements, but without success.

There was one interesting point, Mr. Marshall said, to which he desired to call attention. The word consciousness, as commonly employed, had two diverse meanings. For instance, when we referred to the consciousness of plants, of which Darwin had lately spoken, we referred to psychic existence, as such. When, on the other hand, we stated for instance that we had gone to the theater and met an old friend who so engrossed our attention that we were not conscious of the play, we used the word consciousness with an entirely different meaning. We here referred to a state of "awareness," and that was entirely different from "psychic existence, as such." When we spoke of the seat of consciousness we might mean either the seat of a psychic sense in man, or the seat of awareness. This latter was probably the form of consciousness to which Dr. Peterson referred. When we inquire as to the seat of consciousness as psychic existence, as such, we deal with quite a different question. The evidence at our command at present favored a very broad and exceedingly general seat of consciousness, as thus considered. In the case of the epileptic, to whose sudden loss of consciousness Dr. Peterson referred, there was also a momentary paralysis—a sudden cessation of activities. That distinction was important, because it brought into relation with our states of clear consciousness all those states of what were commonly called our "sub-conscious" mental life; those states which might better be called "sub-attentive consciousness."

Mr. Marshall said that under the view he held, waking and sleeping were objective signs of the same conditions which from another point of view were described respectively as clear consciousness and the lack of clear consciousness.

Professor Frederic S. Lee said that while Dr. Peterson had presented a very interesting idea, his paper gave rise to a considerable number of important questions. First, as to the nature of consciousness itself; whether, for example, it represented a special form of energy or not? The speaker thought that most physiologists would hardly agree with the idea that consciousness represented energy. It had seemed to him that the best working hypothesis for the physiologist was that consciousness was something of unknown nature which merely accompanied the activity of certain brain structures. He did not like the term "epiphenomenon" to express that idea, but since that was the common and accepted term, he would use it. Consciousness, then, was an epiphenomenon accompanying the activity of certain brain structures; or, rather, it was one of the modes of manifestation of their activity, just as chemical, thermal and electrical phenomena were other modes. Consciousness could not put into activity the brain structures. He would not necessarily confine consciousness to the activity of the cerebral cortex only, although he was inclined to believe that consciousness was more particularly associated with the working of cortical cells. Bechterew claimed that in early life, certain parts of the brain below the cortex acted consciously, and that as the tracts between these and the cortex became myelinized and functional, conscious activity came to be preëminently associated with cortical activity. He asked Dr. Peterson how, on the theory that the corpus striatum worked through the mediation of the cortex, he would interpret the behavior of one of Goltz's dogs, from which the cortex had been entirely removed.

Dr. Adolf Meyer said the thesis of Dr. Peterson brought back to us the proposition which Dr. P. Carus advanced about thirteen years ago in the *Journal of Comparative Neurology*, which was based largely on the argument that the corpora striata formed a large, bulky part of the brain to which at the present time no other function could be assigned. Gaule in turn assigned the function to the optic thalamus.

Ignoring entirely the question of what we meant by "consciousness" as a positive function, it seemed that the evidence that Dr. Peterson had brought forth could best be summed up as evidence of vulnerability of mechanisms of consciousness by a lesion in the basal region. It was evidence in favor of the possibility of localizing the lesions in some types of unconsciousness. As soon as we tried to make positive inferences, *i. e.*, as to the "seat of consciousness," we were bound to meet quite a number of difficulties, and one of them was this: Contrary to Dr. Peterson's assumption, the corpora striata had relatively very obscure connection with the rest of the brain. This was one of the greatest stumbling-blocks to the theory advanced that the corpora striata should be of such fundamental importance. So far as we knew, its connections with the cortex were extremely scanty, and with the rest of the base its connections were essentially those with the hypothalamus. On anatomical grounds alone it would be very difficult to explain any connection with the corpora striata and the "seat of consciousness," not to speak of the question whether the "seat of consciousness" could be a safe problem today.

Dr. Smith Ely Jelliffe said that in advancing a materialistic interpretation he felt like the metaphorical individual who rashly rushes in when others, who had preceded him, had tread so lightly. Could not consciousness be regarded solely as the sum of the sensory impulses received, and that it was, regarded from the viewpoint of its content, so far full or complete as the incoming sensory components were sufficiently tense and functionally operative. From this point of view any cutting off of sensory impulses cut out of full consciousness certain elements which, while such might not interfere with its practical integrity, yet made a theoretical subtraction. In alcoholic anesthesia one could see the process of the gradual lopping off of sensory components until the reduction had reached, little by little, such a grade as to result in what is usually termed unconsciousness. In this sense then it was impossible to consider the basal ganglia as the sole seat of consciousness, inasmuch as they contained neurone endings for a part only, and that very small, of the sensory system. Isolated abrogation of the function of the corporata striata was clinically uncorrelated as yet. Gas poisoning softening was a much more diffuse process than that suggested by Dr. Peterson. But the difficult feature of the whole problem still remained, *i. e.*, which element or elements in the sensory arc stood in the foreground as of such primary importance as to perhaps permit of the use of the word "seat." One might lose one's consciousness of the position of the limbs from a lesion, either at Obersteiner's ring, in the cord, in the sensory stations of the midbrain or in the cortex. Where then could one say that limb-position consciousness had its seat? One might thus analyze one by one the components that are here assumed as constituents of a complex termed consciousness. The result would seem to follow that consciousness is a general correlate of sensory functioning and thus it has no necessary single seat, but is a function or sum of functions which has a diffuse anatomical substratum, from periphery to cortex.

THE SERO-DIAGNOSIS OF SYPHILIS IN ITS RELATION TO NERVOUS DISEASE

THE DEVELOPMENT AND CHARACTER OF THE WASSERMANN TEST

By C. F. Boldman, M.D.

After a brief review of Ehrlich's theory of antitoxin production and cytolysis, the speaker described the Wassermann test, which was now being extensively employed in the sero-diagnosis of syphilis. The Wassermann reaction, briefly outlined, was as follows:

Two tubes were prepared with the following contents:

Tube 1. Extract of the liver and spleen of a syphilitic fetus, representing the syphilitic organism (or antigen), plus serum to be tested.

Tube 2. Red blood cells of sheep or other animal, suspended in